

# AVIATION WEEK

A MCGRAW-HILL PUBLICATION

SEPT. 17, 1951

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## Goodyear *CROSS-WIND* Landing Wheels Now Under Trial on C-54

**N**EWEST plane testing the Goodyear Cross-Wind Landing Wheels is the C-54 shown here—biggest airplane to operate with the revolutionary new gear that lets a plane land without reference to wind heading.

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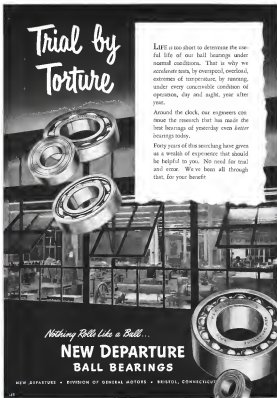
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VOUGHT CORSAIRS flew 13,120 of a total of 16,000 close air support sorties made in the first 11 months of the Korean War by Navy and Marine Corps pilots. This further underlines the soundness of design which still makes the F4U Corsair one of the world's finest fighter-bombers after 11 years of service.

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## NEWS DIGEST

### DOMESTIC

Capital Airlines has renewed contract negotiations with its pilots after a two-week strike. Both sides submitted proposals in light of the Eastern Air Lines settlement in a package pay formula (AVIATION WEEK Sept. 10, p. 16).

Shipments of complete civil aircraft, measured in surface weight, came to 415,730 lb. in June, being 236 planes valued at \$81 million. Cumulative totals for January through June show an 18% decrease in number and an 11% decrease in value compared with shipments for the first six months of 1950.

Gerard B. DeLoach, legislative editor of American Aviation Publications and former executive secretary of the Aviation Writers Assn., died in Washington, D. C. Sept. 5. He was 49.

Douglas Long Beach strike hit about 10,150 employees belonging to Local 145 (IAW) who still in force at present following vote of 172-46 to continue strike in October, when contract expired last Tuesday night. Workmen union wanted pay hike of 10% plus ten cents per hour retroactive to October, 1948; Douglas offered 10% plus six cents an hour and half day at retroactive date. Union threatened company proposal that its offer be coupled with a year's extension of expired contract.

Lockheed Aircraft has signed a contract with the Canadian government authorizing manufacture of the two-seat T-33 jet trainer in that country. The Canadian government has appointed Canadian Ltd., Montreal, in its effort to build the planes and tooling is to begin immediately.

Charles E. Funk, Sr., 73, former president of Delta Air Lines died Aug. 31 at a hospital in Monroe, La. He was chairman of the board at the time of his death and one of Delta's largest stockholders.

Bowing Airplane Co. has filed a criminal complaint against Northwest Airlines in federal court in Seattle asking over \$7 million for damages to business and reputation through publication of "false and defamatory" statements allegedly contained in NW's last Red Hot last year claiming damage to business because of late delivery of Supercoasters, but actual damages proved below it. The complaint is designed to cooperate in the State's case for additional

services rendered, and for spare parts. The manufacturer has filed a demand for a jury trial.

Boeck has delivered the first of the first line of a large number of new engine D-10 transports to the RCAP.

Reg. Gen. Horace A. Shepard has resigned from the USAF to become vice president of Thompson Products, Inc. Gen. Shepard was director of government and production engineering in the Office of Deputy Chief of Staff, Military, Washington.

### FINANCIAL

The Flying Tiger Line has reported record earnings of \$1,399,873 after taxes for the 1950-1951 fiscal year. Gross revenues of \$15,987,018 were more than triple the volume of the previous year. The company's domestic and foreign freight operations produced revenues of \$9,109,040, with other revenues coming from air cargo and lease and outside maintenance for other carriers.

Electric Ship Nut Corp. of Australia, Union, N. J. has declared a 25 cents dividend per share of common stock payable Nov. 1 to holders of record Oct. 15.

### INTERNATIONAL

Dr. Karl Kippler has been named director of a new aviation division set up within the German Ministry of Transport. The Allied High Commission has invited the German government to organize this division to deal with civil aviation matters now administered by the commission's Civil Aviation Board.

Philippine Air Lines has reduced three Cessna Laser 140s for 1953 delivery. PAL also has two DC-6Bs on order.

First of eight VOR coverage stations produced in Germany since the end of the war will be placed in operation near Stuttgart/Gödelshausen Airport. The equipment is being built by C. Lössner AG in Berlin with money furnished entirely by the German government. Installation of all stations is expected to be completed by the end of April 1952.

Prototype Fuchs CME 101K made its first flight of 10 min. duration at Augsburg-Leibniz airport on Aug. 23. The transport is designed to carry 14 passengers.



THE

# CHANNEL ISOLATOR

LESS EACH PILOT CHOOSE HIS OWN IN-UT SIGNALS AND USE EITHER SPEAKER OR HEADSET



Isolation of signals to the cockpit



Isolation of signals to the headset

Individual speaker operation for pilot and copilot

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The ARC radio channel isolator provides two pilots to select 10 separate channels in any combination, independently of each other—without cross-cockpit interference. Radio function can be designed so that each pilot works at peak efficiency in complex navigation and communication situations. A flick of a switch changes from headphones to speaker—without discomfort and pilot fatigue. Write for the details.

### TYPE F-11 Isolation Amplifier



CARTIC No. 184-1 Weight 8 lbs.



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## WHO'S WHERE

### In the Front Office

**Seth B. Thompson** has been appointed assistant to the president of Kaiser Aircraft. In his new position, Thompson, who was formerly staff engineer, will determine methods for engineering efficiency between the firm's various departments.

**A. D. Engle** has been named assistant vice president research for The Aero Co., engineers and builders, and will be responsible for special assignments including foreign work. Engle joined Aero in 1950 and has worked as a member of outstanding aircraft plants.

**James A. Woods** has been elected president and director of U. S. Airlines, in a sweeping change in company management. He has been president of Avco-Defco New Jet Airlines and general manager of American Aircraft Company in charge of design. Woods was elected to the board of the scheduled all-flight carrier. **Charles E. Ripley**, Herbert Charney, Adam C. Thompson (also elected vice president), and Joseph E. Gaudin (also elected treasurer) joined L. Day who elected vice president.

### Changes

**C. I. Van Dusen** has been named general sales manager at both the Milwaukee and Columbia Ohio plants of Wilmington Electric Appliance Division. Other staff changes announced for the area, 3150 W. Columbia St. Chicago, include: **David E. Smith** will be completed early in 1951 as E. I. Smith will be vice manager. **C. D. Heston** will be manager of manufacturing, and **John B. Roman** will be sales manager. To sell vacuum at the Marshall installation, **F. J. Berleson** is promoted to sales manager, **Don E. Richter** moves up to manager of manufacturing, and **Glenn Reising** is promoted to sales manager.

**R. M. (Bobby) Kanes** has joined Kover Power at Willow Run to work as general manager for the C-114 Packard production program.

**E. F. Kettle** has been named assistant plant manager of the Franklin Aircraft Division's Chicago plant. **Joseph H. Brels** has been designated director of industrial relations at the Franklin Aircraft division.

**B. E. Toner** has returned to the Warden-Chester Co. as chief engineer as the Avco division.

**Gilbert I. Clark** has been appointed project engineer of the American Gladiators Co. Company, Pa.

**Walter T. Rife** has been named manager of the new Atlanta Co. division after the Automotive and Government Motor divisions of B. F. Goodrich Co.

**Gilbert F. Quaid** has been designated chief engineer of National Aerochemical Co., Avon, Pa.

**George T. Keller** has joined Southwest Automotive Co., Love Field, Dallas, in the new production.

**Ed J. Masch** has joined the Laidlaw Aircraft Mfg. Co., Folsom, Pa. after their metal laboratories, in general manager.

## INDUSTRY OBSERVER

► The long-tossing New deal for General Motors to build General Motors in Texas is getting hot again. A Detroit paper carried the first story of negotiations last March, but it never got confirmation. Oak recently however, General Motors announced acquisition of a 575-acre site at Arlington, between Ft. Worth and Dallas. Texas reports on this potentially potent J. H. Worth publisher Avco Carter is getting loose; press release behind the deal to get the General Motors organization into the area.

► Boeing's B-52 eight-engine bomber program is getting for slow; in position from planning new. Subcontractors, partly for other manufacturers in a major expansion of ANAC headquarters, Wright-Patterson AFB, Kansas Power will probably be one of the first subcontractors in the eight-engine bomber program.

► Although aircraft manufacturers are still adjusting wage scales to conform with new labor contracts, a report from the Labor Union, report is that they will probably have to begin the talk all over again. Officials in Labor Department say they are under pressure from United Auto Workers to reopen the aircraft industry wage schedule.

► Considerable speculation is circulating in Washington aviation circles that Japan might be the world's first nation to carry all its mail by helicopter. Representatives of the Japanese government has just completed a detailed study of U. S. mail operations and helicopter design, with the specific aim of making reasonable reference to the new independent Japanese government. He has told government officials that following carrying of mail had not been completely successful in Japan due to the short distances between large population centers.

► New two-engine carrier-based bomber A-10 under development by Douglas Aircraft for Bureau of Aeronautics probably represents the ultimate in large plane types suitable for carrier operations. The big plane will weigh about 70,000 lb. It will be in production about the time that Navy's super carrier Forrestal enters fleet service.

► Naval aircraft strength, currently pegged at about 5,700 planes, will increase to about 10,000 at year-end 1951, announced Naval sources say. Production expansion will be aimed at enlarging its current group and introducing new types.

► While the General Electric B-101 represents just about the largest of its type currently in Navy. Air Force is not completing study of engineering proposals for land transport with all large cargo capabilities than the past. General Electric B-101 for very long range transport. All proposals which are being considered contemplate turbo-prop engines, turbojets.

► An Air Force will present both the C-123 and Douglas C-47F from parts to meet replacement for the C-47. Strategic Air Command very long range air transport carrier. As turbine engines, Air Force will use Douglas to modernize some of its obsolete C-47 equipment to B-101. But as C-47 goes into production at Willow Run, some production will be eliminated to meet the SAC requirement. The C-123 placed first in the recently held Hughes Aircraft competition using a Packard C-119, General Motors, Douglas Super DC-3 and the Chase Corp.

► Standardization of the new 28-mm aircraft cannon firing an electrically powered shell, and standardization as a new "family" of four barrels for aerial shot, has obtained much World War II ammunition according to USAF testimony before Congress. The new barrel family includes a low high performance barrel, 1,600 ft. high performance barrel, 1,600 ft. low high performance barrel, and 1,600 ft. low long barrel to be carried externally by fuel jet fighter bombers. General and General Electric have agreed on use of the new barrel types.

## Senate Pushes Build-up for Air Power

Two-thirds of \$5-billion emergency fund would go to AF, one-third to Naval air.

### No Defense Cutting in Congress

Reconvening on the defense bill, he's going to come from Congress. Funds for aircraft and other "armaments" will be passed out as Congress [1951] the emergency and another, it was clear by last week, aren't new in a program to mobilize with the main part of the bill.

• The Senate recently added \$5 billion for air power—a balance required by Defense Department—into the \$50 billion 1952 fiscal year military budget that was approved by the House recently. In fact, the Defense action came through only after repeated readings of department chiefs by Senate Appropriations committees.

• The only try at a major study in the European build-up program stepped. The Senate, 61 to 33, voted down a proposal to reduce by \$250 million the \$5 billion planned for military and that fiscal year—although economic aid was sharply cut. Early this year there was strong opposition to sending to Congress to increase and continuing the House to a "grossed up" to hold the contrast. But opposition faded. The House passed funds for military assistance to non-Communist nations without a penny's cut.

### Plane Production Time-Table

The key reason behind Defense Department's request for \$5 billion additional for air power. Unless more money is made available for contract letting now, aircraft deliveries will sharply decline after mid-1951, and plans will face abandonment.

This is the schedule on the air power build-up:

- Expansion of the industrial base will be completed by January, 1953. The pressure for two and threefold operations will be off.
- The peak in aircraft deliveries will be reached by mid-1952 and then decline. The total production, as projected in the \$5-billion additional request, is less over the next six months. If they are not there will be lost, instead of a leveling off, of deliveries after mid-1953.

Meanwhile, USAF's Secretary Thomas F. Tamm is pushing on the output rate.

- Deliveries are now running about 10% behind schedule and will for the next six months.
- The shipment will be made up by next winter.
- By the end of 1952, deliveries will be running 35% ahead of schedule.

### Air Mail Postage Boost?

If a two-up whether Congress will boost the domestic air postage rate before allowing in a few weeks.

The Senate has voted an increase from 10 cents an ounce to eight cents. If the industrial bill is passed, a move by Sen. Edwin Johnson in strict order the measure. Johnson argued that the postage increase would reduce volume and, instead of giving the Post Office an increase in revenue, would result in decreased revenue from its mail.

Another point against the increase, raised by Sen. Lester Hunt. This increase is an aid volume will increase the volume of mail local carriers on subsidy and might cause some of them to go out of business.

The postage rate increase bill approved by the House Post Office and Civil Service Committee, though, does not take the air mail rate. The measure is scheduled for House action this week. There is strong sentiment on the House side against going along with the Senate vote on a mail postage boost until it is studied in hearings.

### Breaking the Law

The law made the strength of the Air Force "shall not exceed 70 groups."

But through some sleight of hand (group plus super group) it's not.

And although Congress has gotten around to complying with Defense Department's request to repeal the "not to exceed 70 groups" provision, one of its members, Senate Appropriations, has directed that a 91-wing force be "the floor" on air strength.

### Experienced Hand

A familiar hand was devoted to the problems of air power in the nation's defense when Robert A. Lovett was recruited last week by President Truman to succeed Gen. George C. Marshall as Secretary of Defense. Before he became Deputy Secretary of Defense, Lovett had been Assistant Secretary of War for Air and Undersecretary of State. He had been carrying an increasing share of the load in recent months for Marshall.

### PR Personnel Cutback

Prospect is that public information activities of all three services will be sharply cut in the same way.

The Senate reduced funds for the purpose, the House is likely to go along.

The Senate allocated \$9.7 million for public relations activities this year, to be divided equally among the three services. They had a total of 2 million last year, wanted \$13.4 million this year. USAF had asked for \$6 million, Army, \$4.8 million, and Navy, \$4.5 million.

### Burning \$5,400 in 30 Seconds

Rate proponents for a single B-47 takeoff cost \$5,400. USAF reports to Senate Appropriations Committee. Required cost 15 units costing \$3000 apiece. They burn for 30 seconds.

Sen. Joseph G. McCarthy commented: "The further we go into this incredible atmosphere the more open are its becomes."

### Things to Watch For

- New Navy order. Watch for Navy to make a bid for a loan to the \$7,000,000 Fordham in about six months.
- New Navy Secretary. Dan Kimball quickly corrected the report that the Navy didn't want another Chief and Postpaid had been laid. "Now wants to put off construction of another center, he clarified, until it knows all the operational details of the Fordham. But this will be known in "in to eight months," he added.
- Railroad council. Watch for a new drive by the rail to control airways when Senate Labor and Foreign Commerce committee opens hearings on legislation covering the 1950 Transportation Act early in January.

—Katherine Johnson

Paul Administration decision on the 'end focus' for the three services by July, 1951, is due at that date. After the decision is made, the services will calculate the budgets they will require for the '51 fiscal year.

- Prospects—There is no outlook.
- The President, following the recommendations of the Joint Chiefs of Staff, will approve a USAF build-up during the '52 fiscal year in 110 to 120 wings and a build-up of Naval aviation over that period to 16 to 17 major groups.
- But the Administration will not make a commitment to future build-up beyond these goals, putting this off for evaluation when the 1954 fiscal year military program must be decided upon a year from now.
- Your Money to USAF—A \$3 billion allocation from the \$5 billion fund will boost USAF's '52 fiscal year appropriations to \$75 billion, substantially topping Army's budget, \$70 billion, for the first time in history.
- Earlier in the year, USAF "roughly" estimated it would need a \$24.5-billion '52 appropriation to launch a 150-wing program. A slightly larger allocation from the \$5 billion would bring it up to this level.

On later year requirements for the build-up, USAF estimated \$75 billion to build up to 120 wings during the '53 fiscal year, and \$34.6 billion to build up to 150 wings during the '54 fiscal year. The level of annual cost for maintaining 140 wing strength, \$27 billion.

The next couple of years will be capital investments that must be made as much as possible, weighing the factors of the obsolescence of equipment and the need for a substantial amount of flexibility.

"Whether the ultimate strength of the Air Force is 160 groups or 190 or more groups, the assets would be sufficient."

- Key Decisions Due—Key decisions on USAF and Naval air build-up will be made by the Joint Chiefs of Staff, the Secretary of Defense, and the President by Oct. 1.



THUNDERJET ROCKETER

This theory of a Republic F-84E Thunderjet fighter bomber down the right field with an engine load of 500 high velocity air.









MISSILE, for ground-launch use and



GROUND CONTROL, radio guiding it as both turbo-manned and operated

## Swiss Show Anti-Aircraft Guided Missile System

The Swiss firm of Oerlikon, famed for its armament developments, has produced and displayed publicly a new weapon—a complete anti-aircraft missile system.

In what probably was the first such showing anywhere, the Oerlikon Machine Tool Works, Baarlik & Co., of Zurich, only this week exhibited a missile and its control system at the Swiss National Air Display, Dübendorf Air Base, Zurich.

The missile was displayed in its launcher, with ground-control radar on an adjacent trailer. The manufacturer also showed three new search radars designed for fighter movement. Oerlikon developed its best known for its 20-mm aircraft cannon.

◆**Design Looking**—The missile is of unreplicated appearance; its body is about 16 ft. long with faired ends of about 12 ft. Four short cruciform wings are mounted on the body at about the two-thirds point. The general configuration of very thin wings and high fineness ratio hint at supersonic performance.

A liquid-fuel rocket motor is used for propulsion and presumably for steering, since no external aerodynamic surfaces are fitted.

Guidance system is of the beam rider type with a range said to be about 12 miles. The missile leaves transmitter, which sees both a large data antenna and a smaller, different antenna, was developed by Brown Boveri Co., of Baden, Switzerland.

◆**Launching Trailer**—The launching stand is mounted on a four-wheeled

trailer which resembles those used for mobile anti-aircraft artillery in this country. Two horizontal vertical members support two pairs of parallel guide rails which can be elevated or lowered. The whole assembly can be traversed.

The missile is supported in a frame which slides along the four guide rails. The turbo-manned combustion is mounted at a considerable angle of attack within the guide rails, presumably to guarantee rapid firing force at the launch.

Although no booster rocket (or rockets) was shown with the missile, the peculiar arrangement of the frame as the guide rails hint at the use of a booster. In the first place, the frame is mounted on piggy-back style so that if booster went into the frame, they would be instantly close at the muzzle. In the second place, the geometry of the layout places the blast of the opposed booster will clear of the launching structure, which is of course, very necessary. And in the third place, there are slots in the forward and aft corner members of the frame which could be lightning holes, but which probably are gates or postboxes for four booster rockets. They are no rocket missiles of this general size and possible performance which can get away without the use of a booster.

◆**Aircraft Rockets**—Three new search radars were also shown at Dübendorf. One was a beam (about 2 m.) radar and for precision, but which could also be fitted with a whisker. The other two were basically the same firm (about 3 m.) radars, one fitted with an arm-

preparing head and the other with a high-explosive head.

The rocket motor and test assembly weigh 22 lb. The casing is cylindrical, with four stabilizing fins. The fins are raised with sliding holes, two per fin. The motor discharges through a conical nozzle at the base of the rocket. It is claimed that the motor-pneumatic head uses a shaped charge which has penetrative 10 in. of armor. Maximum speed is reported about 2,000 f.p.s.

With double launching racks, a total of 20 of the 8-m. rockets can be fitted to the North American F-34, lightening 3000 lb. of load. The rockets carry four of the double launchers, in which the rockets are mounted in a nose-to-tail fashion. The forward row of five rockets is where the thrust line of the launch rail, if necessary, it appears that the rail now could be fixed link.

## French Gas Turbines To Be Built Here

Manufacturing rights to a group of nine gas turbines have been acquired by Continental Motors Corp., Detroit, from Societe Turbomeca, of France. These units, perfected to the production stage, span a power range equivalent to 200-1,100 hp. One of the engines is a ducted-fan design.

Initial production is slated to be handled by a Detroit subsidiary company—Continental Allison and Engineering Corp.—which is being expanded to take on the new projects.



## First gas-turbine locomotive in America has "16-25-6" in turbine wheel rim

THE steel that solved the problem of turbine stresses in aircraft turbo-supercharger rotors was "16-25-6"—a stainless alloy developed by the Turbine Company. Commercial production of "16-25-6" for jet engine rotors helped make jet-powered aircraft practical.

Now "16-25-6" powers again—in America's first gas turbine electric locomotive, built by the General Electric Company.

Used for the high-speed runs of the railroads, wheel "16-25-6" does not distort under the 1500° F. gases and

speeds of 6700 rpm. Besides high creep strength, it has high resistance to scale and corrosion, excellent weldability, good machinability and forgeability.

Since World War II, the name "16-25-6" has been produced more than all other commercial alloys combined. This record—and the experience that goes with it—makes "16-25-6" the ideal material for today's high speed, high temperature applications. For further information about "16-25-6", write The Turbine Refractory Processing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: TIMKROSC.

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Steel is made by a process called rolling. The finished alloy steel is made by a process called rolling. The finished alloy steel is made by a process called rolling.

# AERONAUTICAL ENGINEERING



Avon 707B

## Triangle Seen as Shape of the Future

**Delta wing helps on aerodynamic problems of high-speed flight.**

Considerable emphasis has been placed lately—both here and abroad—on the delta wing configuration for high-speed flight.

Research on this type of aircraft has been pushed to the point where the merits of the triangular wing almost have unanimously established the configuration as a solution of the aerodynamic intricacy. It is no longer an aerodynamic curiosity.

Optimistic notes on the delta-wing aircraft's characteristics were recently compiled by J. R. Evans, chief aerodynamicist of Britain's A. V. Roe & Co. Ltd., at Manchester. The company has put three delta-wing craft into the air: the 707, 707B and the 707A, which made its first flight only a short time ago (*AVIATION WEEK* Sept. 3, p. 17).

The idea of using the triangular form dates back to Germany's Dr. Alexander Lippisch, who was associated with Messerschmitt A. G. Lippisch's investigations led to the conclusion that this planform was most suited for flight in the sonic region.

By the end of the war, Lippisch had a number of delta-wing projects underway. Included was an unpowered wood glider intended for studies of the delta's low-speed characteristics. This was only partly constructed and was later completed under U. S. orders and brought to this country for investigation.

The delta configuration was studied by many other aeronautical experts. At



Fairey FDL

the 1947 Anglo-American Aeronautical Conference in London it was recommended strongly by Professor Theodore von Karman.

Already, five contemporary basic U. S. and British designs have demonstrated. And Evans says it is pretty certain that others are on the way. The present configurations, in the order of their first flights, are Germany's XFV 12, Avon's 707, British Puffin, Douglas XF 4D, and the Fairey FDL.

Evans' notes are intended to show why there is such interest in the delta wing, and the advantages it possesses the aircraft designer. He develops his theme in a basic manner.

Design's Also-Excess emphasizes that the delta wing is of value only for very high-speed aircraft, thus necessarily implying the use of jet engines at this time.

When projecting the high-speed plane, he says, the designer will attempt to produce an aircraft running the greatest payload for the greatest distance at highest speed, and for in the least expenditure of power, that is, using the least quantity of fuel. This applies to all types of craft—bombers, where payload is bombs and planes, where it is passengers or cargo, or fighters, with guns and missiles.

Speed, Altitude Problems—Next fundamental factor determining what is achieved, says Evans, is the altitude at which the aircraft flies. At higher altitudes, lower air densities results in a decrease of aircraft drag and it is possible to fly at a given speed at an 40,000 ft. for an expenditure of only one-quarter the power required at sea level.

As a plane approaches the speed of sound—about Mach 0.7 for a conventional aircraft—the effects of compressibility become important, the characteristics of the airflow changing suddenly. There is a very large increase in drag, and to push the speed any higher an excessive expenditure of power is required.

With transport and bomber planes, the speed where the drag starts to increase—known as the drag rise Mach number—becomes the maximum cruising speed, because if the plane is flown at higher speeds, the disproportionately higher thrust required means excessive fuel consumption and loss of range.

At a somewhat higher Mach value, there will be changes in the stability of the aircraft and in its response to the controls, leading possibly to complete loss of control.

To bound the speed range, the aircraft must be designed to overcome air delta effects.

Hold Drag Rise—It appears possible by careful aerodynamic design, says Evans, to delay the onset of drag until a Mach value in the region of 0.8 is reached—and this figure is likely to be

Standard-Thomson

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Oil tank vent valve

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Douglas XF4D



Douglas F4U

the practical limit of cruising speed for the swiftest aircraft of all types for many years to come.

The designer of a civil plane, bomber, or long-range fighter, for one, will then be faced with the problem of achieving a Mach number of this order without any drag rise. And he must pay attention to stability changes or lack of control which might occur in this region. This will occupy his attention to the same extent as the purely performance aspect of the drag rise.

► **High Mach Designs**—Even contests that it is quite easy to design a handsome shape which is extremely innocent to Mach number effects. The wing design is difficult—particularly because a wing that is suitable for high speed must also give satisfactory flying properties at low speeds—in takeoff and landing, for example.

As far as flows past a wing, the

speed is measured over its upper surface to a considerable extent, and over the lower surface to a lesser extent—so that there is greater action on the top surface than on the lower. This differential results in the lift which enables the wing to sustain the aircraft's weight.

Thus, at whatever speed the aircraft is flying, the speed of the air around the wing will be higher.

With a plain wing at Mach 0.8, the speed around its upper surface will be equal to or very close to the same speed. At this stage, the wing airflow pattern will be considerably changed. And it is this change that gives rise to the drag and stability effects previously mentioned.

Design advances that there are four ways of improving the high-Mach number behavior of the wing—different methods of keeping down the air velocity around the wing—all of which can



Fig. 1. Effect of sweepback of wing on drag at high Mach numbers.



Fig. 2. Effect of sweepback of wing on Mach number for no drag rise.



Fig. 3. Effect of thickness-to-chord ratio on Mach number for no drag rise.

be applied simultaneously: sweepback, thinness, low wing loading and low aspect ratio.

► **Sweep.** Extent of gains possible from sweepback is very considerable, says Ewing, holding that wing sweep may easily lead to a postponement of the compressibility effects by a Mach value of 0.1. That is illustrated by Ewing in Fig. 1, which compares the drag rise of an unswept wing with one that has 45-deg. sweep. Drag rise for the former occurs at 0.7 and for the latter at 0.83. And Fig. 3 shows how the drag rise Mach number is increased by sweepback.

► **Thinness.** By keeping the wing thin, the amount of air that must be pushed out of the way of the airfoil is reduced, easing its passage through the medium.

Thickness-to-chord ratio—measurement of wing thickness—in the past has ranged from 25% to perhaps 32%. But now, values of 10% down to 7% are becoming common. An indication of the benefits is shown in Fig. 3.

► **Low Wing Loading.** Much effect can be delayed by keeping the wing loading as low as possible—by supporting the aircraft weight with a large wing area. This is particularly important for high

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Fig. 4 Effect of aspect ratio of wing on drag at high Mach numbers

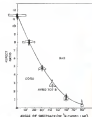


Fig. 5 Relation between aspect ratio and sweepback for stability at the stall

altitude flight, where the low or desert puts a premium on keeping the wing loading low.

Low Aspect Ratio. For moderate speeds, a high aspect ratio—large span relative to the chord—gives greater efficiency. This consideration, says Evans, is no longer important at high Mach numbers. Some alleviation of compressibility effects, he holds, is obtained by reducing aspect ratio (Fig. 4).

Another reason for choosing a low aspect ratio: One of the disadvantages of wing sweep is that wing characteristics at low speed become poor. A typical symptom is that the tip of the sweptback wing stalls, going violent because of the speed field too low.

But research has shown, reports Evans, that this bad characteristic of highly sweptback wings may be overcome relatively easily. Fig. 5 is a graph of sweepback vs. aspect ratio, compiled from a large number of tests of wings with various planforms. Each planform has been classified as giving good or bad characteristics.

It is seen that although almost any aspect ratio can be accepted for an unswept wing, for a 45-deg. sweptback but a ratio of a little over 3 is best.

A third reason Evans reports for

choice of a low aspect ratio is behavior (as regards stability, etc.) in the high Mach number region. Compressibility effects are minimized and a margin of speeds below sonic so steep and above is more readily accomplished if the aspect ratio is low—in the order of 2 to 4.

Delta Planform—If these foregoing requirements are lumped, the result is a highly sweptback aircraft, with thin wing, moderately large wing area, and low aspect ratio. Consideration of geometrical properties and possible planforms of wings leads to the conclusion that the delta wing is the only form which satisfies these requirements. Evans contends. The configuration

possesses high sweepback and low aspect ratio, the wing's area will, of necessity, be generous for the size of the aircraft, and it is easy to build with a low thickness-to-chord ratio.

How does the delta planform, redrafted from considerations of aerodynamic performance, line up with practical design requirements, and in particular, the overriding necessity for keeping weight and drag low in order to obtain maximum performance?

Tail Factor—A paramount point is whether a tailplane (horizontal) tail is necessary. This point long has been raised as to whether aircraft can be flown satisfactorily without a tailplane. Considering only the case of high-speed

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an aircraft, each of the functions of a telephone can be executed, in turn, in relation to the delta-wing aircraft. A telephone functions as:

- **Transmits** changes of CG position according to the load carried and the consumption of fuel. Investigation has shown that a control surface at the trailing edge of the wing, provided that the beam has a large root chord (in the delta), can accommodate all but the extreme CG movements.
- **Deal with** take changes due to landing flaps, etc. While the low wing load rate associated with the delta wing, take-off and landing speeds are moderate without the use of flaps, and this question does not, therefore, arise.
- **Provide damping** of pitching oscillations. The reduction of damping of the pitching oscillation has led to difficulty on some traffic aircraft, but it does not arise on the delta, since the large chord near the root gives adequate damping.
- **Deal with** loss of stability or control power resulting from distortion of the wing structure at high speed (acoustic distortion). At very high speeds, all aircraft structures distort to a greater or lesser extent under the high loads imposed, and this distortion alters the aerodynamic form.

In extreme cases this leads to loss of stability or control power, making the aircraft dangerous or impossible to fly at high speeds. An aircraft with a high aspect ratio swept wing would need a tailplane to deal with this, but the shape of the delta wing makes it comparatively stiff, both in its bending and its twisting, and a telephone does not appear necessary, says Eames.

- **Provide** for spin recovery. Although the point has not been proved, says Eames, it is expected that the controls on a military delta wing would not be powerful enough to recover from a fully developed spin. A telephone appears to be the only way of dealing with this. This restriction is of no real importance for transport or bomber aircraft for which spinning does not occur, but no fighter and fighter aircraft would appear necessary.

Eames concludes that for a delta wing aircraft of the transport type, a telephone is unnecessary. In aviation loads immediately to a considerable saving of weight and drag, and to a major gain in performance.

- **Complexity Reduced**—Compared with a conventional aircraft, the delta wing aircraft will, therefore, be simpler by the criterion of their mass in the tail plane, the rear fuselage necessary to carry it, wing flaps and other high lift devices such as the drooped wing leading edge.

There is a considerable saving of weight, of design and manufacturing effort, and also of maintenance. These

economies will have considerable bearing on the initial cost and the manpower necessary to produce and maintain a number of aircraft.

- **Large Volume**—Because of its shape and the large root chord, the delta wing provides a large internal volume in relation to its surface area, even when using the flame wing sections, which are essential for high-speed aircraft.

Eames holds that for the same wing area, the delta wing has 33% more internal volume than an unswept wing, while if the inboard half of the wing only is considered—since this represents a more practical case from the point of view of the aircraft designer—the internal volume of the delta is more than twice that of the corresponding unswept wing.

Without exceeding a wing thickness of as little as 8 to 10%, Eames says it is possible on a moderate size delta wing aircraft to bury completely the engines, landing gear and inherent fuel tanks, for a very considerable saving. The fuselage also has a tendency to disappear into the wing at the root.

The result, he contends, is an aircraft consisting only of a wing, a fin and a conventional fuselage, representing a type of aerodynamic cleanliness which has never before been reached. This is achieved at the expense of a rather larger wing area than usual, but investigation shows that drag of this sort is considerably less than that due to a combination of engine nacelles, tailplane, etc.

- **Structural Design**—From the design point of view, the shape of the delta wing leads to an extremely stiff structure without the use of thick wing skins, and strength because the delta wing uses fewer rather than structural stiffness. This avoids the redundancy of conventional sweptback wings where the wing has to be made stronger than necessary so that it will be stiff enough. And the delta wing lends itself to conventional design techniques, and to conventional methods of surface construction.

Summarizing his analysis, Eames says that to meet the requirements of large loads for a long range, at high speed, the high-performance transport or military aircraft of the future will arise at a considerable altitude, at a speed not much below sonic. The delta wing provides the only satisfactory solution to these requirements, he maintains, for these reasons:

- It meets the four features necessary for avoiding the drag rise near the speed of sound, it is highly sweptback, can be made very thin, wing loading is low, and aspect ratio is low.
- Extreme wind-tunnel and flight tests have shown that the low aspect ratio delta wing gives maximum change in stability and control characteristics at



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speeds that are near the speed of sound.  
• Even though thin, the delta's airfoil camber is large, so that the engines, landing gear, fuel and all the necessary equipment can be contained within the wing and a redundancy fuselage.

• Aileron control can be obtained by control surfaces on the wing, thus eliminating the need for a conventional tailplane. Together with the "lifting" struts on the mainboom, this leads to considerable reduction in drag, and, therefore, to high performance.

• Auxiliary devices such as flaps, nose flaps, ailerons and the all-moving tailplane are unnecessary, thereby saving weight and drag effort, and simplifying maintenance and inspection.  
• Midship is very stiff and free from fuselage flexing.

## NACA Reports

► **A Newcomer Approach to the Instability Problem of Monocoque Cylinders** (TN 2354)—by Rene A. Boley, Joseph Kemper and J. Mayers

This investigation has two purposes. First, a method is presented which is fairly short and reasonably accurate for the calculation of the buckling load of a monocoque cylinder. Second, a better experimental check (of methods developed earlier for the stress analysis) is afforded by comparing the theoretical and experimental buckling loads for the cylinders considered.

► **The Use of an Unbalanced Case for Determination of Flow Angle and Mach Number at Supersonic Speeds** (TN 2355)—by Martin Cooper and Robert A. Webster

Considerable effort has gone into the development of a means for determining the velocity and attitude of aircraft and missiles at transonic and supersonic speeds. One suggested type of means device has been a cone with one equally spaced radial section and a half-perimeter tube at the apex.

This paper analyzes the results of pressure distribution measurements which were obtained over the forward portion of a slender subsonic body of revolution. Three measurements were made in the Langley 4 × 4 ft supersonic tunnel at a Mach number of 1.19.

Results show that by a simple averaging process, the forebody Mach number could be predicted within 0.01 up to supersonic angles of about 3 deg. Further increases in incidence angle resulted in overestimating the Mach number by as much as 0.05.

Up to an angle of attack of 10 deg., the angle of the angle of yaw was predicted within 0.5 deg. —DAA



VERTICAL SCREEN structure at right is electrical replica of Convair B-36 tail.

## Antennas Tested on Tail Skeleton

Atop the roof of one of the buildings of Consolidated Vultee Aircraft Corp.'s San Diego division is a skeleton structure covered with fine mesh screens. This structure is an electrical replica of the vertical tail of the B-36, and it is as the roof for the sole purpose of developing and testing such antennas.

Last December the electronics laboratory at Convair produced antenna test

equipment in order to do research and development on radio designs. (This was an attempt to Convair's subcontracting the job to more research facilities.) Tests began the April on the design.

The current tests involve changing the location of 12 radio antennas from B-36 wings, tail and fuselage and repositioning them inside the metal skin of the vertical tail.

number 7659/ADO-32. Full title is "Test Procedures—Antenna Radio Equipment Operating Within the Frequency Range of 50 Mcgacycles—400 Mcgacycles."

## Miniature Resistors

The Shuller Manufacturing Co., Collingdale, Pa., has announced a line of miniature hermetically sealed resistors with solder by terminals. The resistors are designed to meet the requirements of JAN-R-93, characteristic A, style RE11.

The units are hermetically sealed in Sinter by a process patented by Shuller Manufacturing and that the process provides positive accuracy against humidity, fungus and salt water.

Dimensions of the resistors are 19/32 in. long, 4 in. diameter. Their rating is 0.25 watts at 250 volts. Resistance values of 0.1, 0.5 or 0.4 megohms may be obtained depending on the alloy wire used for non-inductive wiring.

These resistors are distributed in the company's resistor bulletin B-36.

## PRODUCTION



MOLDING takes place after cavity is filled with powder metal. Dies last 30-50 times longer than deep-draw dies.

CORNING follows molding and casting, gives blade additional strength by further compression.

## Powder Metal Boosts Jet Blade Output

Thompson says 250,000-a-month rate could be raised to 50 million; Rolls-Royce engineers study process.

Jet engine components utilize blade production—250,000 a month—at reduced cost, fewer skilled workers, and less savings in initial outlay. This is the production environment which Rolls-Royce engineers to Thompson Products Plant in Cleveland, Ohio, to study the highly successful application of powder metallurgy from how "Solid" as the study idea by Paul Crawford, Thompson's president, during its recent European visit, Rolls-Royce is now considering a possible license for using the Thompson process in England to meet that country's critical need for jet engine blades.

Bush's experience for the blades are considerably lower than the reported 500,000 a week used in the United States at the present time. But raw materials and manpower shortages in Britain are unique to the point where some means of increasing production for the vital blades is imperative.

► **Potential Gain**—By the powder metal process patented by Thompson, company officials estimate that 50 million of the blades could be turned out a month, if the need arose. They have already stepped up their production from 100,000 to 250,000 a month since the start of the year.

Thompson researchers, headed by

K. M. Barlett, now manager of the company's new Metallurgical Products division, worked out their process after several years of cooperation with American Electric Metal Corp.'s staff, under Dr. Paul Schwenker, a world authority on powder metallurgy.

The Allison division of General Motors was also an important part of the initial research team, since it offered an complete testing facilities. Blades made by the process have been in use in Allison's J-35 jets since 1958.

The powder metal jet engine blades have a number of advantages.

► **Material**—Good—Raw materials are easy to get. Principal material used is iron powder made by a special process from mill scale, a steel mill by-product. A waste and lubricant (Stearate) also is used, and relatively small amounts of powder copper are melted and infiltrated into the powder iron blade. The resulting product is called TP-1, has a tensile strength higher than most of the steel.

Many tons of valuable strategic materials are saved by the powder metal process. Although some chromium and nickel are used in the 200S+ in blade plating, the amount is comparatively small. But if it were used conservatively to produce the possible 50 million blades

by conventional methods, 6,500 tons of alloy would be needed, using \$75,000 pounds of chromium.

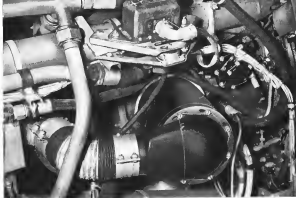
Conventional forgings contain 32% chromium, but powder metal blades require only 1.7% chromium, plus 5% nickel.

► **Conservation**—Strength—There's no waste from TP-1 powder metal blades. Forging or casting blades have a lot of flash. Thompson officials estimate 50% wastage in the production of jet engine blades the old way, plus the extra steel and capacity needed to represent the scrap.

Both static and rotor blades in jet engine compressors need high strength. TP-1 blades are strong and tough. Tensile strength of the blades now being produced is greater than 110,000 psi and can withstand a minimum 20-deg. bend without cracking.

Production tests show random blades are being bent to between 40 and 50 deg. before cracking occurs. The blades have satisfactory resistance to high velocity impact. Deforming from the 50 to 50% density of ordinary powder metal products, TP-1 blades are practically 100% dense.

► **Spray Resistance**—Damage—Their corrosion resistance, provided by the 200S+ in solid plate, plus a flash of chromium, is better than 400 times that of steel, proved by salt standard salt spray corrosion testing. Thompson officials say an antibrake characteristic is



### IN THE NEWS

## NEW GENERATOR MOUNT SAVES TIME AND MONEY



Simple as one, two, three! Fit the generator into slots of mounting ring. Generators mounted on your approach 1. engage by a slight turn, 2. adjust and tighten clamp ring. The QAD mount can be supplied to fit any G-E vertical generator. Simple, inexpensive, light weight, the new mounting can be used to mount a generator on piston engines or a starter generator on jet engines.

This makes job a technician's nightmare when it comes to covering a generator for routine maintenance. General Electric's new, QAD (quick attach-detach) generator mount eliminates the need for universal joints or universal G-E Genstat equipment time is cut from hours to minutes. The QAD has been selected as an industry standard—the hard to get at, inaccessible—by a joint Air Force-Navy committee. It is interchangeable with present generators of equivalent rating.



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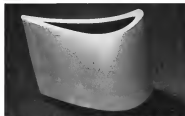
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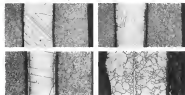




## EQUIPMENT



**PRESS-DRAWN**, hollow, jet turbine blades with tapered walls have been made of RM-6.



**ABSORPTION** (200 magnification) of RM-6 being diffusion treated shows its resistance to heat breakdown. Upper left, at room temp; upper right, after 40 hr. at 1,400°; lower left, after 2 hr. at 1,500°; lower right, after 2 hr. at 2,600°.

## Sandwich Metal Stands up to Heat

**Roslyn copper-core material has high strength at high temperatures, saves on critical materials.**

**By George L. Chastain**

Roslyn Metal is being used increasingly to help solve high-temperature sheet metal problems which plague today's aircraft and engine designers.

In strength, at high temperatures—result of its high heat conductivity—its adjustable control for such applications as jet engine combustion liners and turbine casings and perhaps also for heat exchangers. For the engine casings, this product of American Chalmers Co. is being tried as both inlet and collector ring material in exhaust systems, and, on Convair, it is already

going to excellent account as shell in the form of supercritical tubes.

Still another successful application being tested is boiler drums—and the list of possible parts which are expected to give better performance or longer life is being fabricated from the metal is growing steadily and monthly according to Joseph Krupar, Jr., president of the Company, St. Louis.

► **Metal Characteristics.** High, desirable feature of Roslyn Metal is material for defense production is in use of strategic metals. With the conservation program in full swing, Roslyn

Metal shows significant economies of cost, had to get economies in column, critical, nickel, chromium and tungsten. These are typical examples of how the metal saves without slight sacrifice.

Composites of composition of its rod type sheet, 0.045 in. thick, Inconel Roslyn Metal counterpart, and Roslyn Metal type 321 stainless grade.

	INCONEL	INCONEL	ROSLYN
Nickel	10-15	40-70	2-8
Copper	0	0	55-65
Chromium	18-20	0	10-18
Manganese	0.05	0.15	0
Other elements			
Hardness	110	110	110

A similar comparison for column metal—Roslyn Metal alloy sheet results.

	STANDARD	ROSLYN
	ALLOY	TYPE 304 (18-8)
Nickel	10-15	8-10
Copper	0	55-65
Chromium	18-20	18-20
Manganese	0.05	0.15
Chromium	18-20	18-20
Manganese	0.05	0.15
Other elements		
Hardness	110	110

Krupar expects type 10/9 EL will soon be available without any of the element column.

When type 316 stainless is considered, 3 in. of metal is 10 in. used. The same saving of enhancement is obtainable in type 147.

According to Department of the Interior statistics, 100% of all columbium and 90% of all cobalt used in the country is imported, while the U.S. produces about 70% of its copper ore supplies.

Roslyn Metal consists of a copper core sandwiched between outer covers of various types of stainless steel. The steel gives it strength, the copper conducts heat away from hot spots relieving high stress concentrations and provides easily repaired heat damage over that obtainable with stainless steel only, the company states. Metals are joined by "diffusion bonding."

► **Advantages.** Krupar, told American Wire that Roslyn Metal, because of these characteristics of great strength and high heat dissipation, was well suited to aeronautical applications. He claimed:

• **Fabrication costs.** Time and man hours are often reduced. Stiffness and support members of aircraft components may often be eliminated with the use of Roslyn Metal. The better heat dissipation as a result of the copper core enables thinner fairing air flow of sheet metal parts. Landing wheels by 1/2 in. P-51 and P-50 techniques of the material, has succeeded in eliminating stiffener rings which were incorporated in the original design.

• **Weight is cut.** Although Roslyn

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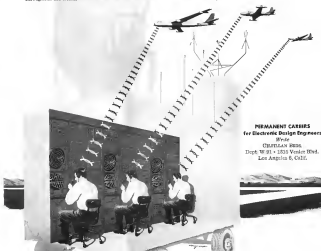
Yet Gilfillan—and only Gilfillan—has preserved the mass production of this GCA, one of the most complex electronic devices ever constructed.

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Metal weights slightly more than stainless (2% more than 321, for instance), components may often be made out of one single lighter alloy. Also, elimination of support members mentioned above causes a weight saving.

• A life increase of up to 500% may be expected when RM is substituted for the simple structure because it contains the modulus of heat spotting and resistance thermal stress.

• Type 321 RM can be used where temperatures of 600 to 1600° are expected, while type 316 RM has excellent properties up to 1600°.

Although Rensley Metal costs about twice as much as straight stainless, Rensley says that consumers find that the cost is justified because of the extra advantages of the metal.

• Latest Case-Labor applications at Rensley Metal according to Rensley are:

• Experimental, because our history is the Alcoa J-13 J-15 jet made of Inconel type RM sheet.

• Westinghouse is making successful jet engine experiments with type 316 RM.

• General Electric is type-testing Rensley Metal J-31 sheet in J-57 engines. The company is considering RM for use in afterburners.

• North American Aviation has reported feasibility on type 347 RM for tailpipes for the F-86.

• Pratt & Whitney, before blades of RM with tapered wall thickness have been made experimentally by Turbo Products Corp., Calif.

RM rotor blades are being tested by a government agency on jet turbine wheels, using a low grade aircraft alloy (type 4130 RM sheet) with no metal content.

• Ryan will make a complete exhaust collector ring system for a propeller engine to be engine control for the jet engine. It can also make inner RM ball and socket joints for C-124 and C-54 exhaust systems.

• Bell is testing RM with ceramic coating. Ceramic coating permits use of lower alloy metal because the ceramic protects the metal from the corrosive

products the metal from the range of oxidation.

• General Electric is experimenting with RM in boiler systems.

• Rocket motor applications are in the offing.

### Plane Parts Shaker

A shaker designed to meet military requirements for vibration testing of parts in being produced by M&E Manufacturing Co., Inc.

The machine develops 2,500-lb force and is capable of 100 accelerations under a table load of 300 lb. It is built to meet Specification MIL-E-5272 and 41065B.

M&E says the unit, Model C-23, features accurate comparison and control both of force and frequency, with electrical interlocks to prevent operator operation. It has a table 20 in. in diameter. The control panel is available with a built-in control for random vibration directly in terms of acceleration, velocity and displacement. The machine weighs 4,500 lb and stands about 34 in. high. No special foundation mounting is required.

M&E Mfg. Co., Inc., 1660 State St., New Haven 11, Conn.

### Nationalist China

#### AF Buys U. S. Lights

U. S. airport lighting equipment is being shipped to the Chinese Nationalist Air Force for installation on Paoan airfields.

Manufactured by various divisions of Westinghouse Electric Corp., the components include 1,600 airport lights of different types, 240 high intensity runway lights of 160,000 candlepower, 452 runway and 516 taxiway runway runway lights.

Also included in the shipment are 1,300,000 candlepower airport beacons, vertical beam landing projectors, oblique beam lights, weather distribution switchboards and lamp bulbs.

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4 TO BATTERY AT TACHOMETERs insert Lub-lube screw through hole in screw and use Lub-lube. An anchor screw is light and can be used in any hole. It is securely locked by metal shell "Lub-lube" (Lub-lube) and is not subject to rust.

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EXHAUST MUFFLER (white tube above) is being retrofitted to fit in DC-3 tailpipe.

## Muffler Quiets DC-3 Engine Noise

Exhaust mufflers, claimed to cut engine noise by 50-60% and to have negligible effect on performance, have been fitted on a DC-3 and have successfully passed Civil Aeronautics Administration installation requirements.

The muffler, developed by Aero Soave Corp., Brooklyn, N. Y., is believed by the firm to be the first used on a twin port type aircraft on day-to-day commercial operation. The plane is owned by Metrol Air Transport, a contract cargo carrier operating from Teterboro Air Terminal, N. J.

The muffler was approved, says CAA, under a Report and Attachment Form 317, applicable only to the specific installation. But engineers of the agency told Aviation Week it likely will be okayed for any Pratt & Whitney R-340 engine (used in DC-3) when Aero Soave installs on a production model.

For Other Transport—Development of the muffler has been closely followed by CAA for more than a year and evaluation is almost complete. Near tests have not yet been made by CAA, but the company says tests by New York University's College of Engineering showed the device cut engine noise up to 60%. Last year, CAA approved its use on a Tri-Wing 150hp Wing Junior (Aviation Week, Aug. 14, p. 32).

Bob Monroe, Metrol president, says steps are being taken to adapt the Aero Soave muffler to a C-46 operated by the airline. He believes the unit also could be used successfully on modern twin ports like the twin-engine Cessna without affecting the slight "jet-sonic" given by tail pipes.

Monroe says the DC-3 seems quieter both to groundcrew and passengers. Noise is reduced particularly in the

cabin, but the pilot, sitting forward doesn't notice the difference as much, he says.

To Go in Tailpipe—The muffler goes over a sleeve consists of a white tube (right) that extends from the tailpipe and fits under the wing of the DC-3—an exhaust scavenging that many airline engineers might not favor. However, this feature may be discarded. The muffler is being brought to fit under the DC-3 tailpipe so only a 6-in. extension will be required. Aero Soave predicts it will perform about the same with this new arrangement. The final installation, for two engines, is expected to weigh 30 lb.

The DC-3 tests, under CAA checks, indicated the muffler caused no excessive back pressure or high lead temperatures under severe flight operating conditions. The unit also stood up well in actual service with the plane on cargo flights. Tests indicated operation at the DC-3's indicated speed of 215 mph and 31 mph running on a single engine with maximum permissible climb power. Manometer checks to determine back pressure showed very little difference from that caused by the standard exhaust manifold, says Aero Soave.

No Backfire—Still entirely at installation stage, the muffler consists of a tube within a tube with a Venturi shaped tailpipe to induce jet action as scum jet climbs. Tubes have thousands of perforations.

Dryer of back fire has been eliminated the firm says, by use of a vent which draws in fresh air through a small forward sloped scoop projecting forward of the new exhaust manifold into the airstream.



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## NEW AVIATION PRODUCTS



### Snap-Action Switch

New, negative switches, featuring simplicity and straightforward design, have been developed by Cherry-Challenger Corp. with an eye on reducing cost savings to equipment manufacturer.

The switches are said to be suitable for aircraft applications. To keep parts down, they are designed of all but the barest essentials, and the maker. They employ air-cooled coil spring construction. This permits models to be supplied through a wide range of actuating distances simply by using a range of the proper characteristics for the job specified.

The units are mounted on Rulacite switch, have bracket and actuator made of brass, bodies of phosphor bronze and silver contacts. One model has a release force of 5.5 oz. and requires an operating force of 2.7 oz. Another has a release force of 4 oz. and operating force of 4 oz. These switches are rated at 6 amp., 125 v. ac and 3 amp., 350 v. dc respectively. Cherry-Challenger Corp., 1408 Skidoo Blvd., Highland Park, Ill.

### Avionic Varnish

A special varnish which meets the high temperature resistance of aircrafts and is in demand reportedly has been developed by J&J, & Blount.

The flame-retarding plastic varnish cements the bulk, insulates the parts required on aircrafts which must operate under high temperature conditions, says J&J & Blount. It also resists salt spray and fungus and is suitable for applications in various electrical equipment.

The product was developed for the firm's JH 1500 aircraft. This unit has operated at temperatures up to 600°F. the company says. It is used for a life of 100 hr. at 500°F, but also is suitable for temperatures as low as -67°F. At lower temperatures life is increased, the firm says.

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## FINANCIAL

### Stock Options Offered to Key Men

Aviation companies join trend toward share-purchase plans as incentive to top management personnel.

Stock options, as management compensation are becoming more widespread among aviation companies. This is in keeping with recent trends in general industrial practice. And consistent to this policy resulted from the special tax treatment written into the Revenue Act of 1953 created by Congress last year.

In order to provide greater incentives to management, the special tax provision permitted officers to buy shares in their own companies under favorable circumstances. With providing heavy income taxes, the concept of large salaries frequently failed to afford adequate net compensation, according to many officials.

**Lightest Tax**—Under the approved stock option form, a bonus is available permitting options recipients to acquire a considerable stake in their companies. As a practical matter, these options are applied to companies to achieve capital gains and so such are not subject to heavy income tax payments.

To qualify for this special treatment the options price must be at least 95% of the market at the time the option is granted. If the option price is 85 to 95% of the market price at the time it is granted, the difference between option and market price is taxed at the full income rate (but not until the stock is sold), and any additional gain in excess of the market price at the time of the option is granted is taxed at capital gains rates.

Other legislation stipulates that stock cannot be sold for at least two years after the option is granted and must be held for at least six months after the option is exercised in order to establish a capital gain.

Thus far, aircraft companies have been quick to grant stock options to management, officers have been slower to act.

**Top Men Favored**—A common characteristic of most aircraft company options plans is their tendency to be closely heavily weighted in favor of top management.

**Douglas** For example, earlier this year, Douglas Aircraft Co. granted options on 30,000 shares to its key officials. Of this amount, options on 20,000 shares were awarded, the president. Seven other officials were to share in the remaining options on 10,000 shares.

These options have been automatically adjusted to a call on a total of 50,000 shares at a total of the twelve five stock split declared by the company. The options are good for five years and are exercisable at 95% of the market price of the stock at the time of the granting of the options.

**United** United Aircraft Corp. awarded options on 100,000 shares of its common stock to approximately 20 of its officials. The individual allocations have not been indicated. It is contemplated that these options will be exercisable over a period not to exceed 10 years and at 95% of the market price when granted.

**Sperry** Sperry Corp. authorized the exercise of options on 200,000 shares to not more than 35 key officials. In this instance, the options will also run for ten years and are exercisable at 95% of the market price of the stock when awarded.

**Thompson** Products, Inc. was authorized to place 77,000 shares of its common stock under option to ten officials. On April 12, the company reported that options on 55,518 shares were allocated to 13 officials at 95% of the closing price of the stock that day.

**Eastman** Eastman Air Lines was the first to exercise to make options available to its top executives under the Revenue Act of 1953. Eastman's plan is unique in that stock options were offered to all employees who had been in the service of the company for three years or longer. Almost 100,000 shares were to be placed under option to about 4,000 employees. No director, including the president of the company, was permitted to participate in this particular plan.

The purchase price was established at \$13.75 per share or 95% of the highest sales price established on the N. Y. Stock Exchange on Nov. 10, 1950, when these options were awarded. The plan is also unusual in that it is one of the very few anywhere which provides for payment through regular payroll deductions by employees of the corporation.

**Western Air Lines, Inc.** also received stockholder authorization to award options on 30,000 shares of its stock to key officials at 95% of the market price for a period not to exceed five years. A personal option plan now affords the president of Western with a call on 25,000

shares of stock at \$9.375 per share up to Dec. 31, 1951.

**Eastern** Eastern Airlines, Inc. management was authorized to allocate 100,000 shares of its common stock to key executives in many forms prior to the Revenue Act of 1950.

**Continental** For example, since 1930, shares of Continental's common stock was allocated to some of its executive officers on Jan. 28, 1950, at \$10.50 per share. This stock is being acquired through a purchase plan with indebtedness to the company in the form of non-interest bearing notes.

**Republic** Republic Airtrans Corp. granted on at its top officers the right to purchase a total of 11,000 shares of its stock at an average price of \$4.75 per share. This was started in June, 1950, and presently, the plan allows an individual to be made over a five-year period.

**American** American Airlines, in June, 1951, awarded its chief executive officer options which was automatically adjusted through stock splits in a call on 250,000 shares of common at \$11.70 per share. This particular option expired on June 1, 1950. In its place, new options on 250,000 shares of common stock were authorized in a limited number of executives at not less than \$11.70 per share up to June 1, 1955. At Dec. 31, 1950 the company reported that options on 147,000 shares at \$11.70 per share were awarded to 30 of its executives.

Significantly, American's plan to award a broader group of its key people options under the Revenue Act of 1950 is under consideration by the Wage Stabilization Board which is to ascertain whether all of these personnel are not in effect additional compensation.

In this same form which may determine the wider utilization of stock options to key executive officials by their respective management.

The option device to make stock available to officials, an advantageous device is well established in American corporate practice. Applied within the confines of stockholders, the principle has led to progressive management policies and resulted the companies involved. This has been a proven criterion in the successful management performance of General Motors, General Electric, and other leading corporations. On the other hand, criticism has frequently been directed at the application of options on a too liberal basis and out of proportion to the success attained by officials for their companies. Owner management is encouraged through the option device, but when possible kept to tangible results, it is considered by the long-range programs of the company involved.

—Selig Altschul

## AIR TRANSPORT

### New Stall Rule Hit As 'Arbitrary'

Industry likes proposed CAB Safety Regulation, except provision for sharp warning 7% above stall speed.

By F. Lee Moore

Transport aircraft manufacturers and airlines this week are trying to get CAA to remove an "arbitrary" stall warning requirement which has been established for transport planes.

They contend the CAA suggested requirement of a sharp stall warning "not less than 7% above stall speed" is the only fault in a new proposed CAB safety regulation on stall characteristics for transport.

One of the other parts of the new proposed stall characteristics, the phase design, spin, pilot and CAA agree. Plans up to stall test for type certification are under 4-4-4, Generalized 740 and Lockheed Super Constellation. Lockheed may be the first to make stall characteristics tests under the proposed regulation.

With the stall warning, the industry wants a qualitative evaluation of stall warning adequacy, not a flat figure written into law. They say the requirement of a sharp stall warning at "not less than 7% above stall speed" means that almost all modern planes would have to have artificial stall warning in electronic form which the industry considers to be wholly adequate for the purpose.

If that problem is solved out the industry expects the newly proposed stall performance regulation to:

- End the risk of testing new transport for CAA certification. Under current CAA interpretation of the pro-

posed stall regulation, flight test crew has had to fly the plane into a deeply stalled condition, which no pilot would have known to do in actual flight. This dangerous testing is only to life of the crew and also dangerous to the early new plane.

- Cut months off testing time for type certification, saving up to an estimated certification which would result in the saving up to an estimated half million dollars per plane.

- Allow removal of spoolers from stalls tests in the Boeing Stratocruiser and Douglas DC-8B. Remove CAA interpretation of the old regulation required spoolers on these planes even though the spoolers detract from actual landing characteristics on landing the plane.

- Regulation Changes—There are three stall characteristic sections in the Civil Air Regulations. Part 43.160 on stall with both engine operating, 43.161 on stall with one engine out, and 43.162 on stall warning. Here are the main changes in these sections which have been proposed by CAB Safety Bureau.

New test procedures in 43.160 would no longer require flying into deep stall. This procedure left the plane shuddering dangerously, losing altitude fast and ready to roll off violently one way or the other. Reports are that Constellation crew was once almost hit on this certification test when the deeply stalled plane finally whipped into a flat spin.

The new stall test requirement would use an "Electronic control" shall be applied at a rate such that the airplane speed reduction does not exceed one mile per hour per second until the airplane is stalled, or at the airplane is not stalled, until the control reaches the stop."

The word "roll" is defined: "The aircraft shall be considered stalled when, at an angle of attack substantially greater than that of maximum lift, the inherent light characteristics give a clear indication to the pilot that the airplane is stalled. No one-down pitch or a roll, which cannot be readily avoided, are typical indications that the airplane is stalled. Other indications may be acceptable if based on a particular case to be submitted in due time." The roll (roll) shall be effected by manual recovery techniques, starting as soon as the airplane is stalled."

The key change throughout this section is the removal of the word "roll" from the definition of the word "roll" for the former definition—"pitching motion."

There is no change in the section 43.161 on stall with asymmetrical stall.

- Modified Change—The stall warning clause 43.162 is the use of the manufacturer's stall warning. It says "due and distinctive stall warning shall be apparent to the pilot beginning at a speed not less than 7% above the stall speed."

The phase design says that the 7% figure written into regulation is too arbitrary. They say you can design a plane and have it turn out safe, but not have a sharp stall warning at 7% above stall speed. On the phase design you must stall warning at 10% above, but not a "clear and distinctive" one until you 5% above stall speed.

Since they cannot design a pre-certified time of aerodynamic stall warning into a plane, the designers see the CAB proposed 7% figure in the CAB Safety Regulation. Phase regulation seems will force installation of artificial stall warning devices on modern transports. These devices are not dependable under all normal flight conditions, the designers say.

Here is the working of the stall warning device: The aircraft industry asked CAA to adopt:

"Sufficiently clear and distinctive stall warning shall be apparent to the pilot with adequate margin to permit inadvertent flight into the stall region with flap and landing gear in its normally used position." At the recent annual review of Civil Air Regulations, the CAA proposed stall warning at 10% above stall speed. Air Transport Association backed the aircraft industry on its wording, and the Air Line Pilots Assn. stipulated 7 to 12% above stall

### IATA Will Study Atlantic Air Coach

This week Pan American and Trans World Airlines will try to persuade other trans-Atlantic air carriers to start twelve or eight services to European main routes. International Air Transport Assn. conference on this question starts today, Sept. 17.

The two American carriers, backed by Civil Aeronautics Board, will urge IATA members to sign an agreement permitting unlimited air carrier operations across the Atlantic. They will point out that the coach level would be no given way, air coach planes must carry most passengers seats, in the yard per mile. Loaded aircraft can be at the same or better, and number of flights would be more, as economic studies show lower fares with rapid potential market.

Pan American will say that it looks toward "keeping the present unbalanced trans-Atlantic air balance" by air coach service.

Trans-Atlantic air coach was agreed to in principle at the IATA conference in May at Brussels. The CAB rejected the agreement (Aviation Week, Aug. 13, p. 17).

The CAB rejection of the air coach change in the May agreement ended the standard and the airlines here apparently. So the carriers are almost re-evaluated these separately, minus the one feature.

Proven this time rejected the low mid-Atlantic requirement, but has provided a standard 75-100 mile per hour between January and March at only 110% of standard one-way fare. Pan Am says it rejected the old jet project of Trans World for the following reasons:

- It failed to do anything for tourists in the money when they were sent to travel—usually mid-summer.
- It diverted traffic from regular mid-summer travel by giving the same service at lower fare.
- It did not promote high-density travel in mid-summer.
- It therefore ran at a loss.

Trans World Airlines is backing Pan Am on re-opening trans-Atlantic air coach starting next summer. Said TWA Board Chairman Warren Lee Poyser in turning over the IATA chairmanship to RMC Chairman Sir Miles Thomas: "Our studies in the industry have severely indicated... that tourism from high density regions can be made to pay the cost one way."

The British government is known to have a quick start of trans-Atlantic air coach because it would have more tourist dollars to Europe. Other governments may find the same, but no one left with willing to go on second with a position as to whether the do-

min carriers would accept the Pan Am TWA proposal for unlimited number of air coach flights. All current must agree, or the matter dies, according to IATA procedural rules.

### Plane Makers Upheld On Safety Measures

A public implication that aircraft manufacturers sometimes compromise safety in favor of economy and competition in transport design drew strong support from both sides in the U.S. and Britain.

The "accident" quoted by the press was from Jerome Lederer, Director of the Congressional Aviation Safety Center at Cornell University, speaking to the Royal Aeronautical Society at its third Anglo-American Aeronautical Conference at Brighton, England.

Rebuted to AP—After making the Associated Press dispatch (see Brighton quoting extracts from Lederer's discussion, the president of U.S. Aircraft Industries Assn., Alfred D. C. Ramsey wrote the Associated Press: "Mr. Lederer's statement is completely unsupported by facts, and must be categorically denied. It can only say that so American aircraft manufacturers have knowingly sacrificed safety in transport airplanes to any other consideration whatsoever." Ramsey also pointed out that of the seven fatal accidents last year, less than one-third were due to structural failure.

Actually, Lederer's remarks on Safety vs. economy were quoted out of context in the press. The conclusion of Lederer's 44-page paper only says that "the aircraft, financial and personal gain."

"The first is that there is a growing recognition in the aviation industry that safety and reliability do have economic values which can no longer be overlooked."

"The second favorable trend is the widespread acceptance in airline circles that safety should be integrated into all engineering concepts."

The most controversial remarks in

indicator of safety should be brought to the attention of student aeronautical engineers early and throughout their college careers... level that he is entrusted in human engineering; a substantial reduction of the overall accident potential should result, adding impetus to the drive for making flight the safest form of transport."

Quote from Lederer—Lederer quoted remark of Lederer's paper is the second and third sentence of the following fact: "... Many engineers continue to look upon safety with indifference as a mere subject that should be considered at some later stage in the design of aircraft. This attitude attitude towards safety is often unfounded and supported by the pressure of economy. The pressure of competition can also be an important factor in delaying the state of safety. The role of civilian aircraft is on the basis of pay load, range, speed, passenger comfort and the most obvious sales appeal. But safety is inseparable of structural or sensory equipment and therefore is difficult to sell from a competitive standpoint."

Lederer's next statement indicates the previous question is a more decision than these remarks. "Offensive these shadowy aspects of air safety are two strong trends in the opposite direction."

"The first is that there is a growing recognition in the aviation industry that safety and reliability do have economic values which can no longer be overlooked."

"The second favorable trend is the widespread acceptance in airline circles that safety should be integrated into all engineering concepts."

The most controversial remarks in



**EASTERN AIR LINES' NEW MIAMI PASSENGER TERMINAL**  
EAL expects to start using new \$21,000,000 passenger terminal by Nov. 1. Eastern's new terminal will have the "largest single airline ticket counter in the world," the company claims. Carrier's Miami passenger handling capacity will be doubled by the new facility. Starting in with the company's \$100-million equipment expansion program, which has been severely re-evaluated.



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trial difficulties may still crop up as the Consolidated RY flying boat, there are probably concerned with its special electronic controls. On the other hand, the DC-6A and L-1049, Douglas and Lockheed are reportedly planning more conventional because possible controls-out the RY electronic prop control.

## Flight Attendants Hit Accommodations

The flight attendants left a Pan American World Airways Boeing Stearman at New York International Airport just prior to takeoff for London on Sept. 14 as protest against five of them having been assigned to sit in the plane's lower deck lounge while not on duty.

A spokesman for the Transport Workers Union (TWU) stated that the personnel left that the accommodations were hazardous, particularly during landings and takeoffs in event of sudden emergencies, and that it had advised its members that the union would back any member who left the plane if assigned to this area against his wish.

A Pan American Airways official pointed out that the Stearmanizer is restricted by FAA to permit seating in the lounge during takeoff and landing and that these seats were assigned the flight attendants because passengers occupied all of the main cabin seats.

Two flight attendants walked off a Stearmanizer in London about a week before for the same reason. In both cases, PAA administrative personnel took the matter into the flight attendants' hands.

## SHORTLINES

► **Air India International**—Overseas branch of India's airline reports increased profits in 1958, more than one-third over year before, to \$5 million. Operating Bombay to London and New York, company now has 300 employees—75 more than a year ago. Half of profits go into government indemnity account, other half into a reserve.

► **American Airlines**—Company will increase its cargo schedules to and from Los Angeles by 50% by year's end. AA cargo director J. D. Dayton says Los Angeles people to the east can enable.

"The effort to maintain a reasonable balance between air and water traffic despite the great volume from production centers of the east." AA's present schedules give 120,000 lb. daily air cargo capacity out of Los Angeles. American has granted pilots an extra \$2.50 an hour for Pacific Airlift flying.

► **British Overseas Airways Corp.**—Car-

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SECTION 3

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air has signed an aircraft manufacturing and building agreement with Fiat-Lancia giving passenger monthly discount on its voyage air war, at the other.

► **Capital Airlines**—Capital earned an operating profit of \$445,634 in July and a net after taxes of \$217,541. Seven months ended July show operating profit of \$1,994,523 and net after taxes of \$938,560. Seasonally operating profit is up 115% and net profit up 70% over a year ago.

► **Civil Aeronautics Board**—CAB approved Joseph H. Fitzgerald, former CAA special attorney, to succeed Robert G. Kinney as director of the CAB Alaska office.

► **Colombia Airlines**—View a record 27,427 passengers in June, 1958 over a year ago. Bermuda traffic was up 47%.

► **Council of Student Travel**—Group has CAB permission to arrange air transport of 400 students from Europe to the U.S. on 18 flights, provided there are no U.S. affiliated carriers or holders of foreign air carrier permits. The American opposed the council's application.

► **Flying Tiger Line**—Curtis claims to have saved the largest single air freight shipment loaded by C-46 when it flew from Long Beach-Jackson bomber pumps from Burbank, Calif., to Waltham Field, Mass. for the U.S. Army Engineers. "Back C-46 carried one pump and two sleds weighing 11,000 lb. Airline found the sleds to distribute weight and other equipment being held load to over 11,000 lb. each.

► **Frontier Airlines**—Local service air line drops more than 1 hr. 10 min. from flight time between Salt Lake City and Albuquerque, following recent Civil Aeronautics Board approval of schedule changes.

► **International Air Transport Association**—IATA has taken on a new active status. The Bureau of European Air Transport Association (BETA), of London, England, Portuguese West Africa, DTA is a companion company to BETA, operating out of Luxembourg, Luxembourg—also an IATA member.

► **Memphis**—Two Memphis IATA members have amalgamated—Gulf Air Lines (TAL) and Helene Airlines (Hellas)—to become National Gulf Airlines (TAL). Total IATA membership is 62 companies, 58 are active, four are associate members.

► **KLM Royal Dutch Airlines**—KLM has signed an aircraft agreement with

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## LETTERS

### Sabena's Contribution

Another item about the United Nations Pacific Affairs which appeared in *Airweek* (July 5) has given me an idea "how one breaks down."

With the possible exception of Canadian Pacific, which may be claiming its place as the Canadian government, I believe that Sabena has the only group of transports which are being furnished by a power in which is a member of the UN. Our planes are not leased or chartered to MATS. They operate by license with MATS, following an instruction by MATS, but they are paid for by the Belgian government.

We have tried to keep three DC4 transports operating in the Pacific South and have been fairly successful, although the crews which are furnished by Sabena have been flying these planes 175 hours a month. The first plane, which went into service the first week of August, 1950, got returned to the Pacific from overhaul after completing 31 crossings of the Pacific before they sent it back to Brussels for overhaul. The Sabena planes chartered by and paid for by the Belgian government received a citation from Admiral John P. Whitney, rear commander of MATS, for the high efficiency of their service.

I am not of hoping that before the Korean War ends, I will be able to get across the fact that Sabena is not just another contractor with MATS getting a slice of the American taxpayer's dollar.

Greene H. Bance,  
Director of Public Relations  
Sabena  
412 Madison Ave.  
New York 17

### Youngstown Airport

Reference is made here to *Airweek* (June 18, 1951, page 8). This is a good but not true statement. As Air Force Command, the Air Force has issued a portion of our field and is in the process of constructing a military installation necessary to the housing, administration and operation of a fighter interceptor squadron. The Air Force has a point-to-point contract with the City of Youngstown which provides for aerial approach to the city and includes certain items of construction and maintenance which the Air Force is to perform. This contract also provides that the present civil operations will not be affected by military activity, and leaves the control and administration of the airport (except for the actual Air Force maintenance area) in the hands of civil authorities.

KENNETH G. GRUNDY, Airport Manager  
Youngstown, Ohio

### From Mexico

We read with great interest your July 2 article by John Whitney regarding Mexican aviation, but left a bit befuddled when it was

discovered that you only mention those airlines which have routes direct to Mexico from the United States. I am attaching herewith a general schedule which will give you some idea of the air operations in Mexico other than those referred to in your article.

Leo J. Danner, Technical Consultant  
Aero Transport, S.A.  
Calle No. 7 A  
Mexico, D.F.

### Where Canaries Sing

I wanted to write you regarding the recent report of one complete operation from the port of New York City to the delightful islands of Barbados. "That move has given all of us who were associated with the company in New York a new lease on life, we have a splendid group of people to work with, we have solid company staying in the term put outside our office as we serve in the morning, and we feel like a part of a young bird during company instead of being put another office abroad as we were in New York."

We are wondering if you could give me some more out of play in an early issue of *Airweek* West, which we (as advertised) know is the outstanding source of current interest in this field.

C. E. Hansen, Sales Promotion Manager  
Toll Call Corp.  
Danbury, Conn.

### Praise

Mr. Penland, president and general manager of Via Panadina's Inductors, Inc., wants me to express his thanks for the first article (July 21) in the *Danvers* process. We both think that you did a great job in handling the facts and writing a most readable article.

Melvin Lorne  
Lorne Weston, Inc.  
1011 North Highland Ave.  
Los Angeles 26

### Saucers

So you'll see a little more discussion on flying saucers? Here's a curious situation. On the short list, 16, five years, the director of the Aero Club of New England, which happens to be the oldest organization of its kind in the country (founded Jan. 8, 1911) suggested to Air Force Secretary Fletcher that "Emerald Saucers" ought to be named for saucers cited. (The instance, the Air Force's own statement that it couldn't account for some of the cases it investigated.) The reply from the Pentagon was that "Project Saucer" would not be cited. Imagine our surprise at being informed immediately afterward by another Pentagon source (on writing over an official agency) that the Air Force had "discovered" the project at all. We were told "Cdr. Harold E. Watson, chief of intelligence, Wright-Patterson Air Force Base, continued to be in charge of the project for the Air Material Command."

So the Air Force spokesman was saying the project was discontinued, another was saying it was still being carried on.

We feel that some highly reliable sources on certain subjects have sent "usual stuff" which the Air Force has been unable to explain. On these, the Air Force just seemed to lose interest and readily give up, after obtaining the "official" press release and other unimportant reports.

ROBERT Z. SULLIVAN, President  
Aero Club of New England

After your editorial on being accused, The Air University President's Inductors, these words "Thou shalt not be accused." That is it.

William G. Kay, Editor  
The People  
Fairfield Square & Airline Corp.  
1111 Eye Street, N.W.  
Washington 6, D. C.

### I. B. M. Reprints

It was with a great deal of interest and pleasure that we read the article entitled "Management Control Series: Memo" (41 United Air Lines) American Week Apr. 35. We feel that the contents of this article would be of great assistance to our field organization and we request permission to reprint that article. We will, of course, give full acknowledgment to American Week C. F. Case, Manager  
Application Development  
International Business Machines Corp.  
190 Madison Ave.  
New York 12.

### Providence Lost

By getting a strong trading place on the drawing accompanying the story on the proposed Sabena-Wagon merger in *Airweek* (June 18), I am able to credit up with a small "best!" The start appears to have moved Providence over into Massachusetts. Think what would happen if you moved Port Wren into Oklahoma.

ROBERT M. HOWARD,  
Assistant Administrator of Aeronautics,  
Division of Aeronautics,  
Hillgrove, N. Y.

### Simulators

I want to compliment you for the fine job which George Christian did on the subject of Link flight simulators in your July 2 issue. This is a very excellent field, but Mr. Christian claimed a last page of it during his visit to my plant.

F. E. MONTANA, Manager  
Industrial & Public Relations  
Link Aviation, Inc.  
Bridford, Bergham, N. Y.

(Editor Robert H. Wood, whose editorial usually appears on this page, is on vacation.)

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